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(54) Title: IMPROVEMENTS RELATING TO ANTIMICROBIAL CLEANING COMPOSITIONS

(57) Abstract

The invention provides a hygienic cleaning composition of pH < 6 or pH > 8 which comprises: a) 0.01-30 wt.% on product of an ethoxylated nonionic surfactant, other than an alkyl phenol derivative, said surfactant having an HLB of 10-14 (this is typically an ethoxylated alcohol having a chain length of C_8-C_{14} and 4-10 ethoxy groups per molecule), and, b) 1-30 wt.% on product of a C_1-C_5 linear or branched alcohol (this is typically selected from the group comprising propan-2-ol, propanol, ethanol and mixtures thereof). It is believed that the use of 1-30 wt.% of a C_1-C_5 linear or branched alcohol as a biocidal activity improving additive for the selected nonionic surfactants greatly improves the biocidal properties of the compositions under the pH conditions specified. The specification also provides a method of cleaning and disinfecting a hard surface which comprises the step of treating said surface with a cleaning composition as claimed.

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IMPROVEMENTS RELATING TO ANTIMICROBIAL CLEANING COMPOSITIONS

Technical Field

The present invention relates to an antimicrobial cleaning composition containing surfactant and a hygiene agent, to the use of a specified surfactant to improve the activity of the hygiene agent and to a method of treating surfaces with the said composition.

Background to the Invention

Hard-surface cleaning compositions generally comprise one or more surfactants, and, optionally, one or more hygiene agents and/or solvents.

Typically, the surfactants used in such cleaning compositions are selected from anionic, nonionic, amphoteric and cationic surfactants. This large group of surfactants exhibit a broad range of properties. Nonionics are very commonly used due to their effectiveness on fatty soils and the ease with which their foaming can be controlled. The precise function of nonionic surfactants in cleaning compositions depends on the hydrophile/lipophile balance or 'HLB' of the surfactant chosen. In general terms, nonionic surfactants with a relatively low HLB values (7-9) are regarded as wetting agents and are used in combination with solvents where the solvent performs the cleaning function, such as in glass cleaners. Nonionic surfactants with relatively high HLB values (13-15) are regarded as detergents and themselves remove soil from surfaces.

Nonionic surfactants are reported as showing low biocidal activity, whereas certain anionic, cationic and amphoteric surfactants show biocidal activity under specific conditions of, for example, pH and concentration. However, the biocidal activity of surfactants is, with a few notable exceptions, low and it is commonplace to add a separate hygiene agent to compositions.

Typical hygiene agents include strong acids, alkali's, phenolics and oxidants such as peracids and hypohalites. These oxidants, of which a typical example is hypochlorite, are generally highly reactive species which exhibit this reactivity alone or in effective formulations in terms of one or more of, short shelf life, toxic, corrosive and irritant properties. In general, these reactive components are required at relatively high levels in formulations. Other less chemically reactive hygiene agents, such as 2,4,4'-trichloro-2'-hydroxy diphenyl ether (available in the marketplace as IRGASAN [RTM]), are effective at relatively low concentrations but are more expensive than simpler species and may be specific as regards their spectrum of activity. Many organic acids, including benzoic, salicylic and sorbic are known as preservatives in cosmetics and some food products, but these preservatives generally show lower biocidal activity than the above-mentioned chemically reactive hygiene agents when used at the same level.

In hard surface cleaning it is often necessary to disinfect a surface. A 'disinfectant' can be understood to be a hygiene agent which shows a 100,000 fold or better reduction in the number of viable micro-organisms in a specified culture when used at a level of around 0.5 wt%. This is generally known as a 'log 5 kill'. Many of the weaker hygiene agents do not achieve this level of

bacterial kill, especially when present in formulations at relatively low levels.

Some surfactants have been found to potentiate the effects of certain hygiene agents. DE 3619375 (Henkel) discloses that alkyl polyglycoside (APG) surfactants show a synergy with alcohols and organic acids as regards hygiene. The examples of this reference disclose compositions which comprise APG and organic acids. These compositions are used at strongly acidic pH, generally below pH 3.

Alcohols, such as ethanol and isopropanol (IPA), are well-known components of cleaning compositions. Generally, these are present as solvents at low levels in compositions of near neutral pH. For example: GB 1076920 (1966) relates to glass cleaners which comprise ~0.25% alkyl phenol polyoxyalkylene ether and 3.5-4% ethanol; GB 1403919 (1972) relates to vehicle washing compositions which comprise 3-4% nonionic surfactant (an EO/PO system is used in the examples) and 4% isopropanol; US 4414128 (1981) relates to hard surface cleaners with 0.5-3% Dobanol 91-8 (HLB 13.8 by calculation) and 1-2% ethanol; GB 2103642 (1981) relates to a spectacle-glass cleaning composition which comprises 1% ethoxylated nonionic surfactant and 10% ethanol: the preferred pH of which is 6-8.

Often these systems are free of ethoxylated alcohol surfactants, e.g. GB 2167083 (1984) relates to a hard surface cleaner comprising 4% IPA and GB 2173508 (1986) relates to hard surface cleaners which comprise 1% of 3,5-dimethyl-1-hexyn-3-ol and 0.45% primary alkyl sulphate as anionic surfactant with 2-4% IPA.

It is also known to use solvents at higher levels in 'spot removers'. Typical examples of such formulations can be found in GB 0962436 (1961) which relates to a solvent-based

spot remover of which the examples comprise 8-35% alkoxylated components (which do not include ethoxylated alcohols) and 20-44% alcohols.

When alcohols are present at very high levels (i.e. ethanol at 70%wt is used in 'surgical spirit') they are also known to have disinfectant properties. However, such high alcohol concentrations are seldom used outside of specialist applications, due to the extreme flammability of the compositions and the health risks associated with consumption.

Thus, where alcohols are present at lower levels, as solvent, it is commonplace to add additional hygiene agents if antimicrobial action is desired. US 4420484 (Sterling Drug: 1981) relates to such an antimicrobial composition. Compositions are disclosed which comprise ~12% nonionic surfactants and 3% iso propyl alcohol. The compositions, which have a pH around 5.5, do not appear to contain alcohol ethoxylate, the surfactant being either betaine or amine oxide. The antimicrobial properties of these composition arise from the known antimicrobials, such are chlorhexidine, which are incorporated in the composition.

There is a need to provide anti-microbial, preferably disinfecting, compositions which do not require the presence of either expensive or reactive hygiene agents such as hypochlorite or peroxides, but which show a wide spectrum antibacterial effect and are formulated with relatively simple and available materials such as solvents. It is also considered important that high levels of alcohols or other solvents should be avoided due to health and fire risks.

Brief Description of the Invention

We have now determined that a marked synergy is exhibited between selected alkoxylated alcohol surfactants and certain alcohols at pH's which lie outside of the normal 'physiological' range in bacteria. This synergy enables much lower levels of alcohols than had previously been employed to have a significant antimicrobial effect.

Accordingly a first aspect of the present invention provides a hygienic cleaning composition of pH<6 or pH>8 which comprises:

a) 0.01-30%wt on product of an ethoxylated nonionic surfactant, other than an alkyl phenol derivative, said surfactant having an HLB of 10-14, and,

b) 1-30%wt on product of a C_1-C_5 linear or branched alcohol.

A second aspect of the present invention of the use of 1-30%wt of a C_1-C_5 linear or branched alcohol as a biocidal activity improving additive in a cleaning composition of pH<6 or pH>8 which comprises 0.01-30%wt on product of an alkoxylated nonionic surfactant other than an alkyl phenol derivative with an HLB of 10-14.

A third aspect of the present invention provides a method of cleaning and disinfecting a hard surface which comprises the step of treating said surface with a cleaning composition of pH<6 or pH>8 which cleaning composition comprises:

a) 0.01-30%wt on product of an alkoxylated nonionic surfactant other than an alkyl phenol derivative with an HLB of 10-14, and,

b) 1-30%wt of a C_1-C_5 linear or branched alcohol.

As discussed above, alkoxylated alcohol surfactants of HLB 10-14 are inhibitors of bacterial growth but are only weakly biocidal at typical formulation pH's. In the presence of the specified alcohols, and outside of the normal physiological pH range, a synergy is maintained and exploited to give a product which is both an effective cleaner and biocidal. Effective cleaning and biocidal activity are desirable in a cleaning composition for hygiene purposes as it is important to both to ensure a high kill of bacteria and removal soil so as to retard reinfection and regrowth of bacterial populations. In the present invention, the important features of effective microbial kill and improved soil removal are both attained with a relatively simple and hence cost-effective formulation.

Without wishing to be limited by any theory of operation, it is believed that the presence of the both the selected alcohol and the selected class of surfactant in the membrane of bacteria results in the formation of 'pores' in the cytoplasmic membrane of the bacteria through which the contents of the cell may be exchanged with the ambient. This has been confirmed by studies with the fluorophore Propidium iodide, which is not taken up by cells with intact membranes. It is believed that bacteria cannot recover from this leakage under the pH conditions specified and consequently rapid cell death occurs.

Detailed Description of the Invention

In order that the invention may be further understood it will be described hereafter with reference to preferred features and materials.

Nonionics

Nonionic, alkoxylated surfactants are present in the compositions of the invention. These surfactants are believed to engage in a synergistic interaction with both the alcohol, to improve cleaning and aid the removal of soil subsequently deposited and with the antimicrobial so as to improve the disinfecting qualities of the composition.

Suitable nonionic detergent active compounds can be broadly described as compounds produced by the condensation of ethylene oxide groups, which are hydrophilic in nature, with an organic hydrophobic compound. The length of the hydrophilic or polyoxyethylene radical which is condensed with any particular hydrophobic group can be readily adjusted to yield a water-soluble compound having the desired degree of balance between hydrophilic and hydrophobic elements (HLB).

Particular examples include the condensation product of aliphatic alcohols having from 8 to 22 carbon atoms in either straight or branched chain configuration with ethylene oxide, such as a coconut oil ethylene oxide condensate having from 3 to 10 moles of ethylene oxide per mole of coconut alcohol.

The amount of nonionic detergent active to be employed in the composition of the invention will generally be from 0.1 to 30%wt, preferably from 1 to 20%wt, and most preferably from 3 to 10%wt for non-concentrated products. Concentrated products will generally have 10-20%wt nonionic surfactant present, whereas dilute products suitable for spraying will have 0.1-5%wt nonionic surfactant present.

Typically, the alkoxylated nonionic surfactant is an ethoxylated alcohol having a chain length of C_8-C_{14} and 4-10 ethoxy groups per molecule. It is however essential that the HLB of the nonionic should fall in the range 10-14. HLB can be calculated as a function of the chain length of the molecule and its degree of ethoxylation. According to Griffin (W.C. Griffin J. Soc. Cosmetic Chemists [5, 249, 1954]) the HLB of fatty alcohol ethylene oxide adducts is given as one fifth of the weight percent of oxyethylene content in the adduct.

It is believed that the critical micellar concentration (CMC) of the ethoxylated nonionic surfactants should be below $10^{-3.5}$ moles/litre, preferably in the range $10^{-3.5}$ to 10^{-5} moles/litre. Quite surprisingly, we have found that for alcohol ethoxylate nonionic surfactants acting under optimum conditions the minimum inhibitory concentration (MIC) for these surfactants appears to be equal to the CMC.

IMBENTIN 91-35 OFA' (TM, ex. Kolb AG) a C_{9-11} alcohol with, on average, five moles of ethoxylation had been found to be a suitable nonionic surfactant in compositions according to the invention. This material has a calculated HLB of 11.6 and is believed to have a CMC of 1.6×10^{-4} moles/litre. DOBANOL 91-8 (TM) a C_9-C_{11} alcohol with on average 8 moles of ethoxylation has also been found to be a suitable material. This material has a calculated HLB of 13.8 and is believed to have a CMC of 4.3×10^{-4} moles/litre.

Alcohols

Preferably, the alcohol is selected from the group comprising propan-2-ol, propanol, ethanol and mixtures thereof.

Preferred levels of alcohol are 1-25%wt on product. At these concentrations alcohols taken alone show little potential as disinfectants. Particularly preferred levels of alcohol range from 5-15%.

Preferably, the weight ratio of the alkoxylated nonionic surfactant to the alcohol such that the alcohol is present in weight excess over the alkoxylated nonionic surfactant.

pH

Preferably, the compositions of the invention further comprise a buffer to maintain the pH of the composition in the desired pH range upon dilution by a factor of 2-5.

Conveniently, the acidic compositions according to the invention have a pH of 3.2-4.5. It is believed that the above pH 4.5 the hygiene benefit of the compositions is much reduced and below pH 3.0 surface damage may occur. The most preferred pH in the acid range is around 3.5. For dilutable products, in typical waters from hard water areas, citrate at a level of 3.5% will be sufficient to reduce the pH on addition of the product of the present invention at 3.3g/l to a pH below 4.0. For sprayable products less steps need be taken to maintain the pH.

The alkaline products according to the invention have a preferred pH of 8-11, more preferably 9.5-11. Below pH 9.5, compositions show reduced bacterial kill, whilst above pH 11, compositions are considered unacceptably hazardous for many uses. Sodium bicarbonate/carbonate buffers are suitable to maintain pH in the preferred range.

Acid products are preferred to alkaline products, as while the antibacterial action can be seen in the higher pH range it is more marked in the acid pH range.

Minors and Optional Components

The composition according to the invention can contain other minor, unessential ingredients which aid in their cleaning performance and maintain the physical and the chemical stability of the product.

For example, the composition can contain detergent builders. In general, the builder, when employed, preferably will form from 0.1 to 25% by weight of the composition.

Optionally, the composition can include one or more amphoteric surfactants, preferably betaines, or other surfactants such as amine-oxide and alkyl-amino-glycinates. Betaines are preferred for reasons of cost, low toxicity (especially as compared to amine oxides) and wide availability.

Typically betaines in compositions according to the invention are the amido-alkyl betaines, particularly the amido-propyl betaines, preferably having an aliphatic alkyl radical of from 8 to 18 carbon atoms and preferably having a straight chain. These betaines are preferred as they are believed to comprise relatively low levels of nitrosamine precursors although other betaines, such as alkyl betaines, can be used in the compositions of the invention.

Typical levels of amphoteric range from 0.01 to 8%, with levels of 1-5wt%, particularly around 2% being preferred for normal compositions and up to four times the

concentration being present in so called, concentrated products. As with the nonionic surfactant, lower levels of around 0.05-1% will be employed in sprayable products and higher levels of, typically, around 4%wt in concentrates.

Metal ion sequestrants, including ethylene-diamine-tetra-acetates, amino-poly-phosphonates (such as those in the DEQUEST^R range) and phosphates and a wide variety of other poly-functional organic acids and salts, can also be employed. It is believed that the hygiene performance of the composition is improved by the presence of a metal ion sequesterant.

In the acid range, citric acid is particularly preferred as a metal ion binding agent as this also functions as a buffer maintaining the composition at a pH in the range 3-5 on dilution. Typical levels of citrate range from 0.5-5%, with higher levels of 5-10% being used in concentrates and lower levels of 0.1-1% being used in sprayable products. Citric can be replaced by other suitable buffering agents to maintain the pH in this range. Citric is also preferred for environmental reasons and a lack of residues as it is believed to be the most cost/weight effective acid.

The solutions do not generally require additional hydrotropes to be added as the alcohols provide a hydrotroping function. Suitable additional hydrotropes include, alkali metal toluene sulphonates, urea, alkali metal xylene and cumene sulphonates, polyglycols, >20EO ethoxylated alcohols and glycols. Preferred amongst these hydrotropes are the sulphonates, particularly the cumene, xylene and toluene sulphonates. Typical levels of additional hydrotrope range from 0-5% for the sulphonates. Hydrotropes are not always required for dilute, sprayable products, but may be required if lower EO or longer alkyl ethoxylates are used or the cloud point needs to be raised

considerably. The cumene sulphonate is the most preferred hydrotrope.

Compositions according to the invention can also contain, in addition to the ingredients already mentioned, various other optional ingredients such as, further solvents, colourants, optical brighteners, soil suspending agents, detersive enzymes, compatible bleaching agents, gel-control agents, freeze-thaw stabilisers, further bactericides, perfumes and opacifiers.

The most preferred formulations according to the present invention, excluding minors, comprise:

a) 0.1-20%wt on product of an ethoxylated alcohol having a chain length of C_8-C_{14}, 4-10 ethoxy groups per molecule and HLB of 10-14,

b) 1-30%wt of an alcohol is selected from the group comprising propan-2-ol, propanol, ethanol and mixtures thereof, wherein the ethoxylated alcohol (b) is present in weight excess over the alcohol(a), and,

c) at least one buffering agent to maintain the pH either in the range 3.5-4.5 or 9.5-11.

It is envisaged that such a composition would be packaged in a container adapted to deliver the composition in the form of a spray and accordingly a preferred method according to the present invention comprises the step of treating a surface with a composition as disclosed herein by means of a spray.

In order that the present invention can be further understood it will be illustrated herein after by reference

to the following, non-limiting examples, and the sole accompanying figure herewith.

Examples

The following examples are suspension tests against a range or microbes at a range of pH's. The following bacterial strains were used in these suspension tests.

Pseudomonas aeruginosa:	ATCC 15442
Staphylococcus aureus:	NCTC 6538
Escherichia coli:	ATCC 11229

Example 1: against *Ps aeruginosa and S. aureus*

Micro-organisms were taken from slopes using 10 microliter sterile loops and cultured in Nutrient Broth No. 2 (supplied by Oxoid Unipath [TM]) at 37°C with constant agitation for 24 hours in a shaking waterbath. Cells were recovered by transferring into 50ml centrifuge tubes, centrifugation in a Mistral [TM] 2000 Centrifuge for 10 min at 4100 rpm and re-suspended in ¼ strength Ringer's buffer. This procedure is believed to give a bacterial suspension of 10^9-10^{10} cfus/ml.

In these experiments the nonionic surfactant used was Imbentin C91-35 ([TM] ex. Kolb) and the alcohol was isopropanol. Test solutions (9ml) were buffered with 0.02% citric acid and 0.01% sodium citrate and inoculated with 1ml bacterial suspension.

Viable organisms were determines by culturing on Nutrient or Tryptone-soya agar for 48 hours at 37°C. Log decimal reductions were determined from the viable counts.

Table 1 shows the selective synergy between nonionic surfactant and alcohol at pH 4.0 against *Pseudomonas aeruginosa* and *Staphylococcus aureus* as identified above.

Table 1: Synergy with Propan-2-ol under Acidic Conditions

Nonionic	Propan-2-ol	Log reduction of S.aureus	Log reduction of Ps. aeruginosa
0	0	2	0.07
0	10	2.4	1.3
0.7	0	2.5	2.4
0.7	10	>6	>6

From the results presented in Table 1, it can be seen that there is effective synergy against both a typical Gram positive and Gram negative bacteria. Comparable results were achieved with ethanol instead of isopropanol..

Figure 1 shows the effect of pH in the acid region. It can be seen that effective synergy is only seen at pH below 6. As the pH is increased towards the neutral, physiological range, the combined effect of the alcoholic solvent and the alcohol ethoxylate surfactant is reduced.

Example 2: against *E. coli*.

Bacterial suspension was prepared as follows. Incubate bacterial culture (tryptone soya broth) for 24 hours. Spin down (50 ml tubes, Mistral 1000 centrifuge, 4100rpm, 10 min). Resuspend pellets in peptone water (20ml) and mix using a vortex mixer for 15-30 seconds. Adjust cell density with sterile peptone water to required inoculum size using

a calibrated densitometer. Cell suspension is stored at 20 °C (+/- 1°C) and used within 2 hours

All tests were carried out using the microplate method for a 5 minute contact time at 20°C, in a 96 well (8x12) microplate with inoculation (30µl of microbe suspension) of the formulations as listed in Table 2 (270µl), to give a total volume of 300µl. The inoculum was estimated to contain *ca*.10^8 cfu/ml. Inoculations were performed simultaneously using a multi-pipette (mixing thoroughly by charging and discharging the pipette 4 times) and the reaction mixture left for a 5min contact time.

Acidic formulations (pH 3.5) were buffered with citric acid (0.02 percent) and sodium citrate (0.01 percent). Alkaline formulations (pH 10.5) were buffered with a mixture of sodium carbonate (1.14 w/v percent decahydrate) and sodium hydrogen carbonate (0.08 w/v percent).

After reaction 30µl of each reaction mixture was transferred into 270µl of a quench solution using a multipipette and mixed as previously indicated. The composition of quench solution was as follows:

Lecithin	0.3%
Sodium thiosulphate	0.5%
L-histidine	0.1%
Tween 80	3.0%
pH 7 buffer(see below)	10ml
Distilled water	to 1 litre

(Prepare pH 7 buffer by dissolving 34gm potassium dihydrogen phosphate in 500ml distilled water and sterilize (autoclave, 121°C, 15 min))

After 5mins(+/-1min), 30µl of the quenched product was serially diluted into 270µl peptone solution using a multipipette, and mixed as previously indicated.

Total viable count was determined using the Miles-Misra spot plate method, plating out 10µl (in triplicate) onto tryptone soya agar and incubating for 24 hours at 30°C. Results were recorded as mean count from 3 spots on agar, calculating Log Reduction for each formulation. as Log Reduction = log (initial count) - log (final count)

Table 2: Synergy with Propan-2-ol under Acidic and Alkaline Conditions

Dobanol 91-8 (w/v percent)	Propan-2-ol (w/v percent)	pH	Mean Log (reduction) *of E.coli*	Standard Deviation
0.7	0	3.5	1.8	0.2
0	8.0	3.5	0.1	0.1
0.7	8.0	3.5	3.8	0.7
0.7	0	10.5	0.9	0.3
0	8.0	10.5	0.3	0.1
0.7	8.0	10.5	3.2	0.5

Table 2 shows that under both acid and alkaline conditions a significant increase in the biocidal activity of the composition is achieved when both the alcohol and the alcohol ethoxylate are present.

Example 3: further examples

Tables 3a and 3b below show further examples, using two nonionic surfactants and two microbes, for which the results were obtained using the method as described above in example 2. In each case that the material was present,

the formulations contained 10% *iso*-propyl alcohol, 0.7% non-ionic surfactant, and were prepared at pH 11.0

Table 3a: Synergy with Propan-2-ol against *S.aureus*

Nonionic surfactant	Iso-propyl alcohol	Log (reduction) against S. aureus
0	0	0
0	10	0
Imbentin 91-35 0FA	0	0.3
Dobanol 91-5	0	0.3
Dobanol 91-8	0	0.1
Imbentin 91-35 0FA	10	1.7
Dobanol 91-5	10	2.1
Dobanol 91-8	10	1.1

Table 3b: Synergy with Propan-2-ol against *E.coli*.

Nonionic surfactant	Iso-propyl alcohol	Log (reduction)
0	0	1.2
0	10	5.1
Imbentin 91-35 0FA	0	5.1
Dobanol 91-5	0	3.3
Dobanol 91-8	0	4.8
Imbentin 91-35 0FA	10	>6
Dobanol 91-5	10	>6
Dobanol 91-8	10	>6

From tables 3a and 3b, it can be seen that, at pH 11, synergy was seen when both the nonionic and the alcohol were present.

CLAIMS

1. A hygienic cleaning composition of pH<6 or pH>8 which comprises:

a) 0.01-30%wt on product of an ethoxylated nonionic surfactant, other than an alkyl phenol derivative, said surfactant having an HLB of 10-14, and,

b) 1-30%wt on product of a C_1-C_5 linear or branched alcohol.

2. Composition as claimed in claim 1 wherein the ethoxylated nonionic surfactant is an ethoxylated alcohol having a chain length of C_8-C_{14} and 4-10 ethoxy groups per molecule.

3. Composition as claimed in claim 1 wherein the alcohol is present in weight excess over the ethoxylated nonionic surfactant.

4. Composition as claimed in claim 1 wherein the alcohol is selected from the group comprising propan-2-ol, propanol, ethanol and mixtures thereof.

5. Composition as claimed in claim 1 wherein the pH of the composition is 3.2-4.5.

6. Composition according to claim 1 which comprises :

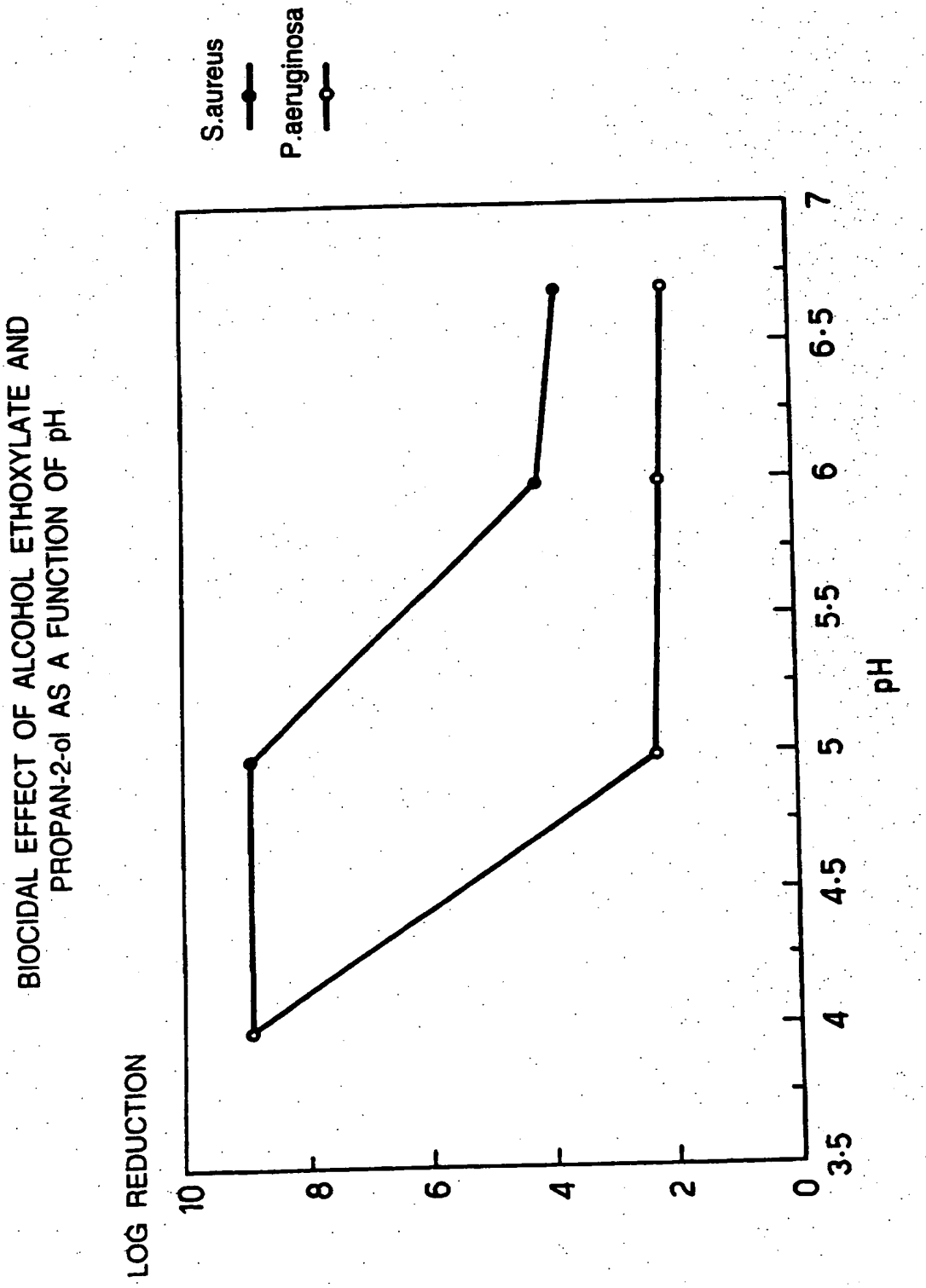
a) 0.1-20%wt on product of an ethoxylated alcohol having a chain length of C_8-C_{14}, 4-10 ethoxy groups per molecule and HLB of 10-14,

b) 1-30%wt of an alcohol is selected from the group comprising propan-2-ol, propanol, ethanol and mixtures thereof, wherein the ethoxylated alcohol (b) is present in weight excess over the alcohol(a), and,

c) at least one buffering agent to maintain the pH either in the range 3.5-4.5 or 9.5-11.

7. The use of 1-30%wt of a C_1-C_5 linear or branched alcohol as a biocidal activity improving additive in a cleaning composition of pH<6 or pH>8 which comprises 0.01-30%wt on product of an ethoxylated nonionic surfactant other than an alkyl phenol derivative, said ethoxylated nonionic surfactant having a HLB value of 10-14.

8. A method of cleaning and disinfecting a hard surface which comprises the step of treating said surface with a cleaning composition according to any one of claims 1-7.


BIOCIDAL EFFECT OF ALCOHOL ETHOXYLATE AND
PROPAN-2-ol AS A FUNCTION OF pH
S.aureus
P.aeruginosa
LOG REDUCTION
10
8
6
4
2
0
3·5
4
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INTERNATIONAL SEARCH REPORT

Inter nal Application No
PC EP 96/04876

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C11D3/00 C11D1/72 C11D3/43

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 478 445 A (PETERS) 1 April 1992 see claims 1,3,4,7,9,14-17,27	1-4,8
X	EP 0 536 820 A (COLGATE PALMOLIVE CO) 14 April 1993 see page 4, line 48 - line 54 see page 5, line 44 - line 50 see page 5, line 54 - line 56 see page 9, line 30 - line 42; claim 1	1,2,4,7,8
X	EP 0 028 038 A (PROCTER & GAMBLE) 6 May 1981 see page 5, line 1 - line 3; example I	1,2,4
A	US 4 420 484 A (GORMAN WILLIAM G ET AL) 13 December 1983 cited in the application see claim 1	1,2,4

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 April 1997	18.04.97

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Loiselet-Taisne, S

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